Summary
The feeding and management requirements of beef cattle from age 6 months to slaughter are described.

Over this period both quantity and quality of feed offered are the main determinants of cattle liveweight gain. Cattle that grow rapidly have better feed conversion efficiency (FCE) than those growing slowly, because less time is spent maintaining the animal’s liveweight and so less feed is required per kg of liveweight produced. Target liveweight profiles should include these features but also need to factor in seasonal pasture growth rates and the need to manage pasture quality.

As feed quality declines, the maximum liveweight gain that can be achieved also declines, even though the animals may be fully fed.

In the summer/autumn, animals generally need to be offered more pasture to achieve similar intakes to those obtained in the spring. The superior intake and performance of cattle in the spring is likely due to:
- An element of compensatory growth after the winter
- The high nutritive value of spring pasture vs. autumn pasture
- An upright leafy pasture structure, which may promote higher intake
- Less effect from fungal toxins in pasture

Although there is no direct experimental evidence with cattle, work with sheep suggests that pre-grazing pasture mass can also affect intake and liveweight gain. It is likely that, below a certain point (approximately 2000kg DM/ha), the animal’s “bite size” is increasingly restricted. Inevitably, this will restrict intake with the effect increasing as pre-graze pasture mass declines. At the other extreme (greater than about 3000kg DM/ha), increasing pre-grazing pasture mass is associated with other problems such as declining pasture quality.

Introduction
At 6 months of age, the artificially reared calves in Chapter 4 join their suckled contemporaries who are typically weaned at this time (5 to 7 months of age). The
suckled calves at weaning are likely to perform more poorly than their artificially reared mates for up to a month after they are weaned – due to their post weaning check. After this point, differences in growth should only be due to breed, sex and differential management factors such as feed levels and parasite control.

In practice, liveweight gain in young cattle is often restrained during their first summer and autumn because of the low nutritive value of pastures as described earlier, whereas a low feed allowance is usually the main factor in restricting liveweight gain in winter and early spring.

**Feed requirements and rate of liveweight gain**

The feed requirements of cattle, as in all ruminants, depend on their liveweight and their liveweight gain. **Liveweight** affects the maintenance requirement for animals and **liveweight gain** affects the energy demands for synthesis of protein and fat. Fat production, or the laying down of fat is energetically more expensive than the laying down of protein. For this reason, young animals are more efficient than animals that are approaching maturity, when body fat deposition is the main energy demand of liveweight gain.

Table 1, derived from Geenty and Rattray (1987) shows the ME requirements of growing cattle at different liveweight gains and different liveweights. To convert the figures to DM requirements, simply divide the figures by the estimated ME content of the feed (Appendix I). For example, a 300kg steer growing at 0.75kg/hd/day would require 73 MJ ME/day or 6.64kg DM/day on feed with an ME concentration of 11MJ ME/kg DM.

*Photo: D Smeaton*
The figures in Table 1 need to be used with care as energy requirements can vary markedly due to the composition of liveweight gain and pasture quality effects (see below). The data in Table 1 assume high quality pasture. As a rule of thumb, and under ideal conditions, cattle can eat up to approximately 3% of liveweight on a DM basis.

### Factors affecting targeted feed intake and performance

Use of the information in Table 1 is not totally straightforward due to the impacts of both pasture quality and pre-grazing pasture mass. Figure 3 in Chapter 3 showed that, as feed quality declines, the maximum liveweight gain that can be achieved also declines even though the animals may be *ad lib* fed. This quality effect is at least partly responsible for the variable performance of cattle at different seasons of the year. Figure 1, below, shows the relationship between pasture offered to growing cattle and their intake in different seasons of the year.

Note that in the summer/autumn, higher allowances are generally required.
to achieve similar intakes to those achieved in the spring. The extent of this effect will depend on the quality of the pasture offered. In addition, the quality of the feed eaten in the summer/autumn will not be as high as in the spring, despite the animal’s attempts to select the better quality components of the sward.

**Figure 1:** The relationship between pasture allowance, or pasture offered, on the intake of growing beef cattle in different seasons of the year.

(Nicol and Nicoll, 1987)

Figures 2 and 3 demonstrate similar effects and show the respective relationships between pasture offered (Figure 2) and residual (post-grazing) herbage mass (Figure 3) on cattle liveweight gain. Many farmers instinctively use residual herbage mass in particular, as a gauge of how well they are feeding their cattle. Note that at the same feeding levels, cattle grow much more rapidly in spring than they do in summer-autumn.
The superior intake and performance of cattle in the spring (compared to the summer-autumn) is likely due to:

- An element of compensatory growth after the winter
- The high nutritive value of spring pasture as described above
- An upright leafy pasture structure, which may promote higher intake
- Less effect from fungal toxins in pasture

Although there is no direct experimental evidence with cattle, work with sheep suggests that pre-grazing pasture mass can also affect intake. It is likely that, below a certain point (approximately 2000kg DM/ha), the animal’s “bite size” is increasingly restricted. It therefore has to take more bites to achieve the same total intake as cattle on longer pastures. Inevitably, this will restrict intake with the effect increasing as pre-graze pasture mass declines. At the other extreme (greater than about 3000kg DM/ha) increasing pre-grazing pasture mass is associated with other problems such as declining pasture quality.
Figure 3: The relationship between residual herbage mass and the liveweight gain of cattle in different seasons of the year.

(Nicol and Nicoll, 1987)

Feed Conversion Efficiency (FCE) or Ratio (FCR)
While commonly referred to as FCE, the strictly correct term for this feed efficiency indicator is FCR, being the ratio of feed intake to liveweight gain (see Chapter 8 for details). More efficient animals therefore are those with a low FCE or FCR.

The liveweight gain of a beef animal at any given weight dramatically affects the FCE of that animal. Table 2 shows how the FCE of a 300kg steer can vary widely depending on the liveweight gain of that animal. This would suggest that we should always grow cattle at the maximum possible liveweight gain to optimise FCE. However, high feeding levels usually result in a reduction in pasture utilisation and this can have flow-on consequences for pasture quality later on, as described in Chapter 6. This conflict between maximising animal liveweight gain for best FCE and maintaining pasture quality, is discussed in detail in the next chapter.
The impact of FCE is dramatically demonstrated in Figures 4 and 5 both of which have been derived from Stockpol™, a computerised decision support tool. Both bull growth rate curves (Figure 4) are entirely feasible but each uses quite different amounts of DM (Figure 5) for the animals to grow from weaning to their slaughter endpoint. In total the slow growth rate bulls consumed 4047kg of DM and the fast growth rate bulls consumed 3249kg DM. The slow growth rate bulls consumed 25% more DM in their finishing system than the fast growth bulls. Again, the lesson appears to be simple; the faster the animal grows, the better the FCE and the less DM required to achieve a target liveweight. However, as described above and shown in more detail in Chapter 6, it is nowhere near as simple as Figures 4 and 5 indicate, owing to numerous factors such as the impact of differing feed costs during the year (Chapter 12), seasonal pasture growth rates, the need to manage pasture quality, availability of supplements and their price, the competing needs of other stock classes etc.

Figure 4: Target liveweight profiles for fast and slow growing bulls starting and finishing at the similar liveweights: both profiles are feasible on-farm. Simulated on Stockpol™, a computer based decision support model.

<table>
<thead>
<tr>
<th>LWG (kg/hd/day)</th>
<th>0.25</th>
<th>0.5</th>
<th>0.75</th>
<th>1.0</th>
<th>1.25</th>
<th>1.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCE (kgDM/kg LWG)</td>
<td>19</td>
<td>11.4</td>
<td>8.8</td>
<td>7.6</td>
<td>6.4</td>
<td>6.3</td>
</tr>
</tbody>
</table>
**Figure 5:** Daily feed intake of fast and slow growing bulls from 12 weeks of age at 100kg through to slaughter at 500kg liveweight. Simulated on Stockpol™.

**Target liveweight and sward criteria**

Table 3 shows some recommendations for feeding bulls on pasture over the autumn-winter-spring period. This information should be used in addition to the feeding recommendations provided above. The pre and post-grazing recommendations ensure that bite size is maintained, in order that pasture intake and liveweight gain targets are met.

**Table 3:** Example minimum-target sward conditions and animal performance outcomes for each season on a bull finishing system: for the autumn, winter and spring periods. Pasture data are kg DM/ha. Average liveweight gain is described by ADG: extracted from Coutinho et al (1998).

<table>
<thead>
<tr>
<th></th>
<th>Pre-grazing (kg DM/ha)</th>
<th>Post-grazing (kg DM/ha)</th>
<th>Avg. cover (kg DM/ha)</th>
<th>ADG (kg/head/day)</th>
<th>Final weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autumn 3 Apr - 30 Jun</td>
<td>2700</td>
<td>1500</td>
<td>1800</td>
<td>1.2</td>
<td>280</td>
</tr>
<tr>
<td>Winter 1 Jul - 1 Sep</td>
<td>2800</td>
<td>1100</td>
<td>1700</td>
<td>0.5</td>
<td>325</td>
</tr>
<tr>
<td>Early Spring 1 Sep - 1 Oct</td>
<td>2700</td>
<td>1500</td>
<td>1800</td>
<td>1.5</td>
<td>370</td>
</tr>
</tbody>
</table>
Conclusion

In this and the previous chapter, target liveweights and the feeding and feed management requirements of cattle have been described. The next chapter describes how to get the correct amount of the right quality of feed in front of the animals, to achieve the target live weights suggested, at a price that is profitable.

The final target slaughter or sale weight of an animal should always vary, depending on the value of the animal at a particular point, and the marginal cost of taking it to a heavier weight vs. the marginal returns that can be generated by doing so.

Prime cattle ready for slaughter, Northland. Photo: P Packard
This must always be compared with the returns that could be obtained from allocating available feed to some other stock class. Circumstances driving these factors will vary, between and within farms, and seasons. For this reason, recipe target live weights cannot be delivered that hold true for all cattle all the time. This maddening uncertainty is what makes pasture based livestock farming so challenging.

**Further reading**


Joyce, J.P.; Bryant, A.M.; Duganzich, D.M.; Scott, J.D.J.; Reardon, T.F. 1975. Feed requirements of growing and fattening beef cattle: New Zealand experimental data compared with National Research Council (U.S.A.) and Agricultural Research Council (U.K.) feeding standards. New Zealand Journal of Agricultural Research. 18: 295-301.


